
Practice Patterns

Trends in Inpatient Treatment Intensity among Medicare Beneficiaries at the End of Life

Amber E. Barnato, Mark B. McClellan, Christopher R. Kagay, and Alan M. Garber

Objective. Although an increasing fraction of Medicare beneficiaries die outside the hospital, the proportion of total Medicare expenditures attributable to care in the last year of life has not dropped. We sought to determine whether disproportionate increases in hospital treatment intensity over time among decedents are responsible for the persistent growth in end-of-life expenditures.

Data Source. The 1985–1999 Medicare Medical Provider Analysis and Review (MedPAR) and Denominator files.

Study Design. We sampled inpatient claims for 20 percent of all elderly fee-for-service Medicare decedents and 5 percent of all survivors between 1985 and 1999 and calculated age-, race-, and gender-adjusted per-capita inpatient expenditures and rates of intensive care unit (ICU) and intensive procedure use. We used the decedent-to-survivor expenditure ratio to determine whether growth rates among decedents out-paced growth *relative* to survivors, using the growth rate among survivors to control for secular trends in treatment intensity.

Data Collection. The data were collected by the Centers for Medicare and Medicaid Services.

Principal Findings. Real inpatient expenditures for the Medicare fee-for-service population increased by 60 percent, from \$58 billion in 1985 to \$90 billion in 1999, one-quarter of which were accrued by decedents. Between 1985 and 1999 the proportion of beneficiaries with one or more intensive care unit (ICU) admission increased from 30.5 percent to 35.0 percent among decedents and from 5.0 percent to 7.1 percent among survivors; those undergoing one or more intensive procedure increased from 20.9 percent to 31.0 percent among decedents and from 5.8 percent to 8.5 percent among survivors. The majority of intensive procedures in the United States were performed in the more numerous survivors, although in 1999 50 percent of feeding tube placements, 60 percent of intubations/tracheostomies, and 75 percent of cardiopulmonary resuscitations were in decedents. The proportion of beneficiaries dying in a hospital decreased from 44.4 percent to 39.3 percent, but the likelihood of being admitted to an ICU or undergoing an intensive procedure during the terminal hospitalization increased from 38.0 percent to 39.8 percent and from 17.8 percent to 30.3 percent, respectively. One in five Medicare beneficiaries who died in the hospital in 1999 received mechanical ventilation during their terminal admission.

Conclusions. Inpatient treatment intensity for all fee-for-service beneficiaries increased between 1985 and 1999 regardless of survivorship status. Absolute changes

in per-capita hospital expenditures, ICU admissions, and intensive inpatient procedure use were much higher among decedents. Relative changes were similar except for ICU admissions, which grew faster among survivors. The secular decline in in-hospital deaths has not resulted in decreased per capita utilization of expensive inpatient services in the last year of life. This could imply that net hospital expenditures for the dying might have been even higher over this time period if the shift toward hospice had not occurred.

Key Words. Medicare, end of life, elderly, health care expenditures, intensive care

Thirty percent of Medicare expenditures are attributable to the 5 percent of beneficiaries who die each year, resulting in per-capita spending on decedents that is six times as great as for nondecedents (Hogan et al. 2001; Lubitz and Riley 1993). This observation attracts policy attention in part because of the concern that much of the expensive care that dying Medicare beneficiaries receive, particularly in hospitals, is ineffective. Yet it is not always possible to determine *ex ante* that care will be futile; not everyone who receives expensive care is known to be terminally ill, and most of the people who receive such care survive (Knaus et al. 1993). Nevertheless, Congress legislated the addition of a hospice benefit for Medicare beneficiaries in 1982 because they believed it would be possible to identify patients who were terminally ill and eligible for low-intensity services that could relieve suffering and, perhaps, decrease costs.

Indeed, between 1988 and 1995, the proportion of Medicare beneficiaries dying in an acute care hospital decreased while the proportion receiving hospice care and home health care before they died increased (Garber, MaCurdy, and McClellan 1999). However, contrary to expectations,

This research was conducted at Stanford University and the National Bureau of Economic Research in Palo Alto, California, and was supported in part by grants AG17253 and AG05842 from the National Institute on Aging and by the Homer Laughlin Endowment. Amber Barnato was supported by training grant T32 HS00028 from the Agency for Healthcare Research and Quality to Stanford University, and by career development award 1 K08 AG21921-01 from the National Institute on Aging.

Address correspondence to Amber E. Barnato, M.D., M.P.H., M.S., Assistant Professor of Medicine and Health Policy and Management, University of Pittsburgh, 230 McKee Place, Pittsburgh, PA 15213. Mark B. McClellan, M.D., Ph.D., is with Stanford University School of Medicine, Stanford, CA, and the United States Food and Drug Administration, Washington, DC. Christopher R. Kagay is with UCSF School of Medicine, San Francisco, CA; Alan M. Garber, M.D., Ph.D., is with Stanford University School of Medicine, the Veterans Affairs Palo Alto Health Care System, Palo Alto, CA, and the National Bureau of Economic Research, Inc., Palo Alto, CA.

Medicare expenditures for dying beneficiaries have not fallen as these new forms of care at the end of life have been adopted (Garber, MaCurdy, and McClellan 1999). The failure to reduce aggregate end-of-life expenditures may be due to delayed referral to hospice (Christakis and Escarce 1996). Or hospice care may not actually be cost-reducing as it is commonly believed, producing an “add-on” cost rather than a substitution, particularly for noncancer diagnoses (Campbell et al. 2002; Emanuel 1996). Part of the riddle lies in the degree to which hospice services become substitutes for inpatient care, and the other part relates to whether secular trends in treatment intensity over time are influenced by the availability of these less intensive alternatives. The adoption of more expensive or intensive medical technology over time may also explain why end-of-life expenditures have not fallen. Although real prices for many forms of medical care may stay relatively constant (or even decrease) with time (McClellan and Cutler 1996), increased utilization of medical services and shifts to more expensive forms of care appear to be the most important potentially controllable causes of the increase in expenditures among Medicare beneficiaries in general (Fuchs 1999) and may contribute to expenditure increases among decedents. In fact, acute hospital expenditures in the final month of life grew an average of 4.7 percent per year between 1988 and 1995 (Garber, MaCurdy, and McClellan 1999). If treatment intensity over time has increased disproportionately among the sickest patients (e.g., those who are most likely to die), real savings that result from less intensive care in the final weeks of life for those patients using hospice may be insufficient to offset rising hospital expenses.

To learn whether changes in treatment intensity accounted for increases in end-of-life inpatient expenditures, we examined the use of major intensive services at the end of life, comparing the experience and expenditures of decedents between 1985 and 1999 with surviving Medicare beneficiaries.

METHODS

We studied 20 percent of all Medicare decedents and 5 percent of all survivors in 1985, 1987, 1989, 1991, 1993, 1995, 1997, and 1999. We used surviving Medicare beneficiaries as comparators to account for secular increases in treatment intensity among all patients. We sampled all beneficiaries who were alive on January 1 of the calendar year; those who were alive on December 31 of the year were defined as “survivors” and those who were dead by December 31 were defined as “decedents.” We studied only patients older

than age 65 and excluded Medicare beneficiaries who had any of the following characteristics: discontinuous enrollment in Medicare Part A or Part B during the year in question; residence outside the United States or foreign hospital admission; enrollment in a health maintenance organization for all or part of the year; hospitalization in a federal hospital. We used these exclusions because hospital utilization records could be incomplete for these beneficiaries. For each of the eight years we assembled the acute care hospital claims from the Medicare Medical Provider Analysis and Review (MedPAR) files for decedents in the 365 days preceding their deaths and for the survivors during the calendar year. Thus, for decedents, we included claims in the calendar year of death as well as the calendar year preceding death. We studied inpatient claims for acute care hospitals only because these reimbursements are the largest component of Medicare-covered services and because acute care hospitals remain the site of the most technologically intensive health care services.

We calculated hospital expenditures using Medicare diagnostic related group (DRG) reimbursement plus per diem and outlier reimbursement, where relevant, as listed in each hospital claim. For the purposes of the analysis, admissions to both coronary care units (CCUs) and traditional intensive care units (ICUs) were considered ICU admissions. We condensed the *International Classification of Diseases*, 9th Edition (ICD-9) procedure codes into 228 categories using an algorithm nearly identical to the Clinical Classification System (CCS) developed for the Agency for Healthcare Research and Quality (AHRQ). For this study, we report data on the 88 procedure categories that are performed primarily in the inpatient setting, which were likely the primary reason for admission (see Appendix). To calculate cost, we attributed the cost of an entire hospitalization to the one or more intensive procedures performed during that hospitalization, rather than microcosting the marginal cost of the procedure itself. If more than one procedure was performed during an admission, we distributed the hospitalization cost proportionately to the total facility relative value units (RVUs) associated with that procedure in the Medicare physician fee schedule for 2000. Many other common inpatient procedures (e.g., colonoscopy) that we did not include among the 88 studied often are performed in the outpatient setting, and inpatient claims would not provide complete capture of utilization trends.

We calculated summary statistics for hospital and ICU use, inpatient procedure use, and expenditures for decedents and survivors using *SAS* (SAS Institute 2002). We described beneficiaries as having one or more hospital admission, ICU admission, or intensive procedure. All 88 intensive procedures were bundled into "one or more" procedures; thus, a patient who had

one intensive procedure in the year and a patient who had five procedures are each counted only once in the numerator. Additionally, we calculated rates of receipt of each of the 88 individual procedure groups. We used the 1995 decedents as the reference population for direct age-, sex-, and race-adjustment of all summary statistics. We performed age-adjustment in five-year increments (65–69, 70–74, 75–79, 80–84 and ≥ 85), and analyzed race by grouping all beneficiaries into the categories “black” and “nonblack,” excluding all beneficiaries with “unknown” race. We calculated expenditures in 2000 U.S. dollars, inflated using the gross domestic product (GDP) inflation index.

RESULTS

Sample Demographics

A 20 percent random sample of all Medicare patients who died (decedents) and a 5 percent sample of all patients who were in Medicare at the beginning of the year and did not die (survivors) in 1985, 1987, 1989, 1991, 1993, 1995, 1997, and 1999 comprised the study sample. The overall number of beneficiaries in the sample who met the study criteria was almost 1.5 million each year. All reported differences are statistically significant at the $p < .05$ level.

Between 1985 and 1999 the mean age of fee-for-service decedents increased by two years (Table 1), reflecting both improved life expectancy and differential movement of younger beneficiaries into managed care plans over this time period. Among both decedents and survivors, women outnumbered men, and women were particularly overrepresented among survivors as they outlived their male peers. Blacks were relatively overrepresented among decedents.

Absolute Changes in Expenditures and Utilization

Real inpatient expenditures for the fee-for-service population increased by 60 percent, from \$58 billion in 1985 to \$90 billion in 1999, one-quarter of which were accrued by decedents. Expenditures attributable to hospitalization for the 88 intensive procedure groups in this study accounted for 45 percent of total inpatient expenditures for both decedents and survivors in 1999, up from 28 percent and 37 percent for decedents and survivors, respectively, in 1985.

Between 1985 and 1999, trends in utilization were mixed for both decedents and survivors. The percentage with one or more hospital admissions during the year changed little; among those admitted at least once, the number of admissions per person increased but the length of stay (LOS) decreased for

Table 1: Demographic Characteristics of Medicare Fee-for-Service Decedents and Survivors, 1985 and 1999

| <i>Year</i> | <i>1985</i> | | <i>1999</i> | |
|--------------------------------|------------------|------------------|------------------|------------------|
| <i>Cohort</i> | <i>Decedents</i> | <i>Survivors</i> | <i>Decedents</i> | <i>Survivors</i> |
| Sample population | 264,230 | 1,192,108 | 277,467 | 1,179,903 |
| Medicare population, millions* | 1.3 | 23.8 | 1.4 | 23.6 |
| Mean age, years | 80.3 | 74.9 | 82.0 | 76.1 |
| Women | 52.7% | 60.8% | 56.4% | 60.3% |
| Black | 8.1% | 7.4% | 8.5% | 7.3% |

*Projected for the Medicare fee-for-service population based on a 20% sample of decedents and a 5% sample of survivors not enrolled in managed care.

both groups (Table 2). Total per capita use of ICUs increased among both decedents and survivors. The percent of decedents who underwent one or more intensive procedures in the year before death increased from 20.9 percent to 31.0 percent; for survivors the proportion who underwent one or more intensive procedures during the calendar year increased from 5.8 percent to 8.5 percent (Table 2). The mean number of intensive procedures increased from 0.35 to 0.64 procedures per person among decedents and from 0.08 to 0.13 per person among survivors (Table 2). Fewer Medicare beneficiaries died in an acute care hospital in 1999 than 15 years earlier, but those who did were more likely to be admitted to an ICU during their terminal hospitalization and to undergo an intensive procedure (Table 2).

A decedent was much more likely than a survivor to undergo any one of the 88 procedures (Table 3); however, the vast majority of the procedures performed on Medicare patients were done in the far more numerous survivors. The exceptions include procedures that are emblematic of aggressive end-of-life care. In 1999 half of feeding tube placements, 60 percent of intubations and tracheostomies, and three-quarters of open or closed cardiac massage were performed on people who would soon die. Additionally, the majority of brain biopsies and esophageal varices injections in any year were performed on decedents.

Relative Changes in Expenditures and Utilization

As noted above, all measures of expenditure and, with the exception of hospital length of stay, all measures of utilization increased. As described above, absolute increases were greater among decedents. However, to

Table 2: Acute Care Hospital, ICU, and Intensive Procedure Utilization among Decedents and Survivors, 1985 and 1999[¶]

| <i>Cohort</i> | <i>1985</i> | | <i>1999</i> | |
|--|------------------|------------------|------------------|------------------|
| | <i>Decedents</i> | <i>Survivors</i> | <i>Decedents</i> | <i>Survivors</i> |
| Per-capita inpatient expenditures* | \$10,567 | \$1,831 | \$16,320 | \$2,866 |
| One or more acute care hospitalization | 74.3% | 20.5% | 74.9% | 21.3% |
| Average number of claims [†] | 2.4 | 1.6 | 2.8 | 1.9 |
| Average length of stay, days | 13.4 | 9.2 | 9.6 | 7.6 |
| Any ICU admission | 30.5% | 5.0% | 35.0% | 7.1% |
| Any intensive procedure | 20.9% | 5.8% | 31.0% | 8.5% |
| Average number of procedures | 0.35 | 0.08 | 0.64 | 0.13 |
| Died in an acute care hospital | 44.4% | — | 39.3% | — |
| ICU stay, terminal admission | 38.0% | — | 39.8% | — |
| Intensive procedure, terminal admission | 17.8% | — | 30.3% | — |
| Average number of procedures, terminal admission | 0.27 | — | 0.55 | — |

[¶]Age-, sex-, and race-adjusted.

*2000 U.S. dollars.

[†]Given one or more acute care hospitalization in the year.

Table 3: Utilization of Selected* Intensive Procedures among Decedents and Survivors, 1985 and 1999

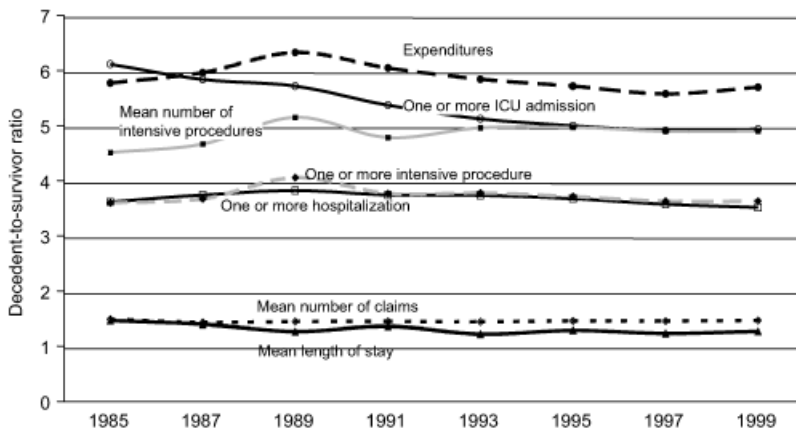
| <i>Procedure</i> | <i>1985</i> | | <i>1999</i> | |
|---|------------------|------------------|------------------|------------------|
| | <i>Decedents</i> | <i>Survivors</i> | <i>Decedents</i> | <i>Survivors</i> |
| Intubation and tracheostomy | 2.30% | 0.07% | 10.70% | 0.45% |
| Heart valve procedures | 0.16% | 0.04% | 0.41% | 0.14% |
| Coronary artery bypass graft | 0.38% | 0.19% | 0.94% | 0.55% |
| Percutaneous coronary interventions | 0.07% | 0.06% | 1.04% | 0.74% |
| Cardiac catheterization and arteriography | 0.87% | 0.52% | 3.19% | 1.73% |
| Permanent pacemaker [†] | 1.92% | 0.39% | 1.43% | 0.55% |
| Carotid endarterectomy | 0.29% | 0.08% | 0.35% | 0.30% |
| Feeding tube placement | 1.41% | 0.08% | 5.25% | 0.29% |
| Colon resection | 1.67% | 0.40% | 1.82% | 0.42% |
| Excision and lysis of peritoneal tissue | 0.90% | 0.19% | 1.24% | 0.28% |
| Transurethral prostatectomy | 1.41% | 0.79% | 0.53% | 0.29% |
| Treatment, fracture of hip and femur | 2.75% | 0.69% | 3.59% | 0.83% |
| Hip replacement, total and partial | 0.15% | 0.13% | 2.04% | 0.75% |
| Knee replacement | 0.07% | 0.17% | 0.19% | 0.54% |
| Amputation of lower extremity | 1.09% | 0.12% | 1.18% | 0.14% |

*Partial listing reflects those procedures that each contributed \geq \$500 million to inpatient Medicare expenditures in 1995 using an RVU-weighted method of attributing the costs of a hospitalization among one or more procedures performed during the inpatient stay.

[†]Insertion, replacement, revision, or removal.

understand how these changes fit into secular trends of increased treatment intensity for all patients in the United States, we focus here on relative changes, using survivors as intensity growth “controls.” We express these relative changes in expenditures and utilization over time as decedent-to-survivor (D:S) ratios (Figure 1). An increase in the ratio over time implies that growth among decedents outstripped growth among survivors. Overall per-capita expenditures were 5.8 times higher for decedents than survivors in 1985, peaked at 6.3 times higher in 1989, then dropped down to 5.7 times higher by 1999 (Figure 1). The D:S ratio of expenditures attributable to hospitalization for the 88 procedures in this study increased from 0.76 to 1.0, suggesting that procedure-attributable spending increased faster for decedents than survivors. Overall hospitalization rates and claims per person hospitalized at least once changed in tandem among the two cohorts with constant D:S ratios between 1985 and 1999. The D:S ratio for length of stay (LOS) decreased from 1.5 to 1.3 due to greater decreases in LOS for survivors than for decedents over the period (Figure 1). The D:S ratio for ICU admission decreased from 6.1 to 4.9 over the time period, reflecting faster growth in ICU use among survivors than decedents (Figure 1). Per-capita rates of one or more intensive procedures were 3.6 times higher among decedents than survivors in 1985, peaked at 4.1 times higher in 1989, and returned to 3.6 times higher by 1999, but the mean number of procedures received by decedents increased from 4.5 to 4.9 times higher than survivors over the period (Figure 1).

Figure 1: Relative Trends in Utilization Expressed as the Decedent-to-Survivor Ratio, 1985–1999



DISCUSSION

Between 1985 and 1999, the 5 percent of Medicare fee-for-service beneficiaries over the age of 65 who died accounted for one-quarter of inpatient expenditures each year. Hospital stays for all patients shortened significantly while real per-capita spending, ICU admissions, and intensive inpatient procedure use grew. As expected, decedents were more likely than survivors to receive intensive inpatient services in absolute terms. Contrary to our hypothesis, however, most measures of per-capita utilization of intensive services—including per-capita expenditures, hospital and ICU admission rates, and the likelihood of undergoing an intensive procedure—did not grow faster among decedents than among survivors over the 15-year study period. The measures of treatment intensity that did grow faster among decedents were the mean number of intensive procedures received and hospital expenditures attributable to those procedures.

Thus, greater growth of inpatient spending and intensity among decedents does not explain the stability of total Medicare spending for patients in the last year of life in the face of fewer hospital deaths. What are alternative explanations? Consider that per-capita annual treatment intensity and expenditures grew at the same rate among decedents and survivors *despite* policies that led to the increased use of alternatives such as hospice and a decrease in the proportion of Medicare beneficiaries who died in the hospital. If the same proportion of patients died in the hospital now as in the past, those patients would have been exposed to more opportunities for hospitalization, and total inpatient expenditures and utilization might have been higher than they are now.

The trend in ICU use deserves further exploration because it differed from most other utilization trends. The rate of one ICU admission or more grew faster among survivors than decedents. This suggests that although intensity is increasing over time, there is a systematic difference in the use of this resource between survivors and decedents. Perhaps ICU admission itself confers a meaningful survival benefit, so that patients who received ICU admission were also more likely to be in the survivor cohort. An alternative explanation is that doctors tend to admit patients to the ICU who have reasonable chances of survival, for example, patients with metastatic cancer are relatively underrepresented in U.S. ICUs (Angus et al. 2003). Also, it may reflect postoperative ICU admissions for some of the intensive procedures whose use grew faster among survivors than decedents (e.g., bypass surgery).

Our findings are subject to several limitations. We focused only on inpatient services and did not study trends in outpatient or post-acute

treatment intensity because the hospital remains the delivery site of the most expensive and technologically intensive medical care. It is possible that trends in nonacute-care hospital expenditures and treatment intensity differ from those we observed. By narrowing our study to 88 of 228 procedure categories, we selected those procedures that were most important financially to the Medicare program. Our categories were also chosen to minimize the likelihood that any could have been received in an outpatient setting by healthier patients. Our measures of utilization generally underestimated the intensity of treatment by calculating the rate of *one or more* hospitalization, ICU admission, and intensive procedure in the year. To address the fact that decedents are more likely to have multiple admissions and multiple procedures, we also reported mean number of claims and procedures per capita. We chose to use Medicare reimbursement, including outlier payments, as our measure of resource use since this reflects the U.S. Treasury's actual liability. These payments, though, may not represent actual costs of care provided, particularly for decedents. Even though the average DRG weight was greater for hospitalizations of decedents than survivors due to a greater prevalence of DRG-modifying complications and comorbidities, for any particular DRG, one might expect a decedent's resource use to be higher than the average cost reflected in the DRG payment more frequently than a survivor's resource use. Decedents were more likely to generate outlier payments. Outlier payments partially compensate hospitals for unusually costly cases (e.g., reimbursing 80 percent of cost-adjusted charges above the hospital's fixed-loss threshold). So inclusion of outlier payments into our calculations improves the capture of significantly above-average case resource use.

Finally, these observations are based solely upon enrollees in fee-for-service Medicare. If beneficiaries at low risk for using health services selectively enroll in managed care, our results might underestimate the growth in the decedent-to-survivor ratios, since those surviving beneficiaries left behind would be more likely to utilize intensive services than those moving into managed care. The pattern of procedure use may be different for Medicare beneficiaries enrolled in "risk plans," under which capitation is expected to diminish the use of both hospital care and intensive procedures.

The clinical and policy implications of our findings rest on the secular trends we observed in population-based inpatient treatment intensity and spending. If increased treatment intensity does not correspond to improvements in health outcomes or patient satisfaction, then the trends we observed over the 15-year study period raise concerns regarding the efficiency of Medicare spending. Fisher found no cross-sectional associations between high

treatment intensity and these outcomes (Fisher et al. 2003a, 2003b), however, this does not exclude the possibility of improvements in life expectancy over time resulting from secular trends in treatment intensity. We do not directly address the appropriateness of end-of-life treatment intensity, and acknowledge that it cannot be judged solely by survival rates among individuals who receive intensive treatments, since a survival benefit is consistent with a very high mortality rate, as long as it is lower than mortality without the treatment. Furthermore, although individual decedents were more likely than survivors to utilize intensive services, survivors outnumber decedents and, as a group, receive the majority of such services. The exceptions were procedures that are somewhat emblematic of end-of-life care: 50 percent of feeding tube placements, 60 percent of intubations and tracheostomies, and 75 percent of cardiopulmonary resuscitation attempts are done in those who will soon die.

Despite increased attention to palliative care and the increased availability and uptake of hospice services over the past 15 years, treatment intensity among patients in their last year of life has kept pace with survivors in most domains (except ICU admission) and the mean number of procedures received has actually grown faster among decedents. Furthermore, although fewer beneficiaries die in an acute care hospital now than in the past, those who do are being treated more intensively and expensively. We cannot know whether observed trends in inpatient treatment intensity would have been different had Medicare-financed alternatives such as hospice and home health care not been introduced during this time period. However, given the secular trends we document, in inpatient treatment intensity it is entirely possible that Medicare costs for the dying may have been even higher than they are now had there been no alternatives to hospital-based death.

ACKNOWLEDGMENT

The authors would like to thank Olga Saynina for her invaluable programming assistance.

APPENDIX

INTENSIVE PROCEDURE GROUPS STUDIED

Automated implantable cardioverter defibrillator (AICD); Amputation of lower extremity; Ankle/foot joint replacement; Aortic resection with

replacement; Appendectomy; Arteriogram and venogram (not heart or head); Biopsy of spinal cord; Bone marrow transplant; Cardiac assist device/ECMO/bypass; Cardiac catheterization, coronary arteriography; Carotid endarterectomy; Central vessel endarterectomy or thrombectomy; Cerebral arteriogram; Cholecystectomy and common duct exploration; Closed control of upper gastrointestinal bleeding; Colon resection; Coronary artery bypass graft (CABG); Creation of arteriovenous fistula; Cystectomy; Enterostomy; Electrophysiology Study with or without radiofrequency ablation; Esophagectomy; Excision, lysis peritoneal tissue; Exploratory laparotomy; Feeding tube placement; Fundoplication; Genitourinary incontinence procedures; Hemodialysis; Hip replacement, total and partial; Hysterectomy; Ileostomy and colostomy; Injection or ligation of esophageal varices; Insert/replace/revise/remove permanent pacemaker; Insertion, temporary cardiac pacemaker; Intracoronary artery thrombolytic infusion; Intubation and tracheostomy; Jaw fracture repair; Kidney transplant; Knee replacement; Laminectomy, disectomy, arthrodesis; Laparoscopic cholecystectomy; Laryngectomy; Lobectomy; Local excision lung/bronchus; Mastectomy; Mastoidectomy; Mediastinoscopy; Nephrectomy; Oophorectomy, unilateral and bilateral; Open biopsy lung/bronchus; Open cholecystectomy; Open CNS biopsy; Open CNS diagnostic procedures; Open CNS therapeutic procedures; Open control of upper gastrointestinal bleeding; Open heart repair of septal defects; Open or closed cardiac massage; Open prostatectomy; Orchiectomy; Pancreatectomy/pancreaticoduodenectomy; Partial/total gastrectomy and gastric bypass; Pelvic exenteration; Percutaneous CNS biopsy (stereotactic/burr hole); Percutaneous transluminal coronary angioplasty (PTCA); Pericardial procedure; Peripheral vascular bypass; Peripheral vessel endarterectomy/thrombectomy; Pneumonectomy; Pyloroplasty; Radical prostatectomy; Regional/radical lymph-node dissection; Revision/repair of vessel/vascular procedure; Skin graft; Small bowel resection; Splenectomy; Surgical removal of urinary calculus; Thoracotomy; Thyroidectomy; Transurethral prostatectomy (TURP); Treatment, fracture of hip and femur; Treatment, fracture of lower extremity; Treatment, fracture of radius and ulna; Vagotomy; Valve procedures (including replacement); Vena cava interruption; Ventricular shunt.

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